

optical output surface 53. A rare earth metal thin film 56, which functions as the optical filter, is deposited on the output surface 53 of the light source 52. Said rare earth metal thin film 56 may comprise a rare earth metal selected from the group consisting of trivalent rare earth metals that are reactive with hydrogen to form both metal dihydride and metal trihydride reaction products, and such metal dihydride and metal trihydride reaction products have differing optical transmissivity. The rare earth metal thin film 56 is heated to an elevated temperature by a thermal energy source 54 that is separate from the light source 52. The rare earth metal thin film 56 is also overlaid by a protective layer 57, which may comprise a hydrogen-permeable material, such as Mg, Ca, Al, Ir, Ni, and Co, or a metal selected from the group consisting of palladium, platinum, and iridium.

GI  
Cmcl  
H<sub>2</sub>  
S.H.

#### IN THE CLAIMS

Please amend claim 63 as indicated.

30. A hydrogen gas detector, comprising:
- a light source;
  - a thermal energy source that is separate from the light source;
  - an optical filter having an optical transmissivity responsive to the presence and concentration of hydrogen gas in an ambient environment to which the optical filter is exposed, said optical filter being disposed in proximity to the light source such that said optical filter is illuminated with light from the light source, and being operatively coupled to the thermal source such that the optical filter is heated by the thermal source to an elevated temperature;

a light detector generating an output signal, the state of said output signal being proportional to the intensity of light impinging on the light detector, said light detector being disposed in light-sensing relationship to the optical filter, whereby light from the light source passing through the optical filter impinges on the light detector and generates said output signal as a indication of the presence and/or concentration of hydrogen gas in the ambient environment.

31. The hydrogen gas detector of claim 30, wherein the light source comprises a light-generating element selected from the group consisting of incandescent bulbs, light emitting diodes, fluorescent lamps, electroluminescent lamps, and optical lasers, and optical waveguides illuminated by any such light-generating element.

32. (Amended) The hydrogen gas detector of claim 30, wherein the thermal energy source comprises a heat-generating element that is separate from the light source selected from the group consisting of resistive wires, exothermic chemical reactions, ultrasonic radiation, acoustic radiation, microwave radiation, and laser radiation.

35. The hydrogen gas detector of claim 30, wherein the light detector comprises a light detection element selected from the group consisting of photodiodes, avalanche photodiodes, phototubes, photomultiplier tubes, microchannel plates, solar cells, image intensifiers, photoconductor detectors, charge-coupled devices, and combinations or arrays thereof.

36. The hydrogen gas detector of claim 30, wherein the optical filter comprises a rare earth metal thin film deposited on an optical output surface of the light source.

37. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film comprises a rare earth metal component selected from the group consisting of trivalent rare earth metals reactive with hydrogen to form both metal dihydride and metal trihydride reaction products, wherein the metal dihydride and metal trihydride reaction products have differing optical transmissivity.

38. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film comprises at least one metal selected from the group consisting of:

scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, actinium, thorium, protactinium, uranium, neptunium, plutonium, americium, curium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, and lawrencium,

alloys thereof, and

alloys containing one or more of such metals alloyed with an alloying component selected from the group consisting of magnesium, calcium, barium, strontium, cobalt and iridium.

39. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film comprises yttrium.

40. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film is overlaid by a hydrogen-permeable material comprising a metal selected from the group consisting of Pd, Pt, Ir, Ag, Au, Ni, Co, and alloys thereof.

41. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film is overlaid in sections by a plurality of hydrogen-permeable material, each comprising a metal selected from the group consisting of Pd, Pt, Ir, Ag, Au, Ni, Co, and alloys thereof, wherein each overlay section exhibits a unique permeability to hydrogen.

42. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film is overlaid by a hydrogen-permeable material that is doped with a dopant selected from the group consisting of Mg, Ca, Al, Ir, Ni and Co.

43. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film is overlaid in sections by a plurality of hydrogen-permeable materials, each of which is doped with a dopant selected from the group consisting of Mg, Ca, Al, Ir, Ni and Co, wherein each overlay section exhibits a unique permeability to hydrogen.

44. The hydrogen gas detector of claim 36, wherein the rare earth metal thin film is overlaid by a thin film of a material including a metal selected from the group consisting of palladium, platinum, and iridium.

45. A hydrogen detection system for monitoring an extended or remote area region for the incursion or generation of hydrogen therein, said hydrogen detection system comprising a multiplicity of hydrogen gas detectors as in claim 30, each of which is arranged for exposure to a specific individual locus of the extended area region.

63. (Amended) A hydrogen gas detector comprising:  
a light/heat source,  
an optical detector, and  
an optical barrier between said light/heat source and said optical detector, said optical barrier responsive to a presence of hydrogen and to heat from said light/heat source for affecting a transmission of light from said light/heat source through said optical barrier in a manner detectable by said optical detector.

64. The hydrogen gas detector of claim 63, wherein the light/heat source comprises a lamp element emits heat incident to the generation of light.

65. The hydrogen gas detector of claim 63, wherein the light/heat source comprises an incandescent lamp.

66. The hydrogen gas detector of claim 63, wherein the light/heat source comprises a fluorescent lamp.

67. The hydrogen gas detector of claim 63, wherein the optical barrier comprises a rare earth metal thin film.

68. The hydrogen gas detector of claim 67, wherein the rare earth metal thin film is deposited on a roughened substrate and has a roughened surface morphology.

69. The hydrogen gas detector of claim 68, wherein the substrate is roughened by a method selected from the group consisting of mechanical roughening, chemical roughening, deposition of highly exfoliated or porous inorganic underlayers, and deposition of porous polymer underlayers.

70. The hydrogen gas detector of claim 67, wherein the light/heat source comprises an incandescent lamp having an outer surface, and wherein the rare earth metal thin film is deposited on said outer surface of the incandescent lamp and is overlaid by a protective film that is permeable to hydrogen gas.

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### REMARKS

#### Specification

The Examiner has objected to an informality where feature 52 of Fig. 11 has mistakenly been labeled "32". This has been corrected as indicated above and the objection is respectfully requested removed.